



# BTA/BTB16 and T16 Series

SNUBBERLESS™, LOGIC LEVEL & STANDARD

16A TRIACs

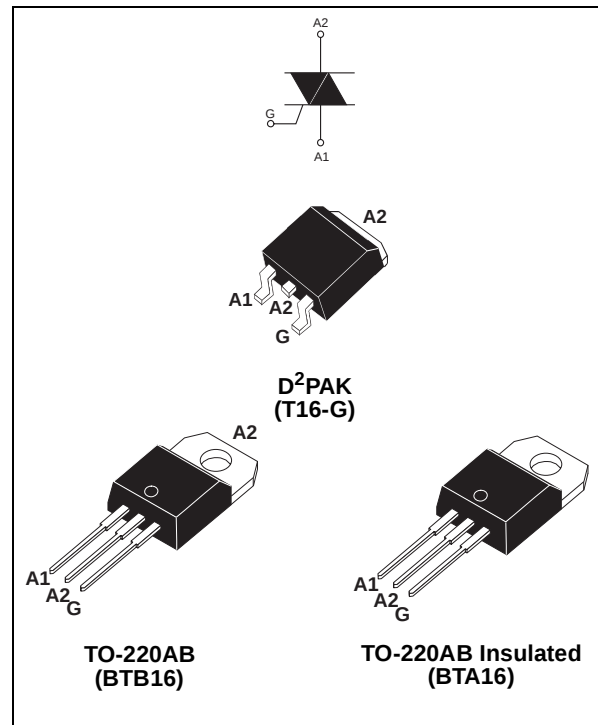
## MAIN FEATURES:

| Symbol            | Value            | Unit |
|-------------------|------------------|------|
| $I_{T(RMS)}$      | 16               | A    |
| $V_{DRM}/V_{RRM}$ | 600, 700 and 800 | V    |
| $I_{GT}(Q_1)$     | 10 to 50         | mA   |

## DESCRIPTION

Available either in through-hole or surface-mount packages, the BTA/BTB16 and T16 triac series is suitable for general purpose AC switching. They can be used as an ON/OFF function in applications such as static relays, heating regulation, induction motor starting circuits... or for phase control operation in light dimmers, motor speed controllers, ...

The snubberless versions (BTA/BTB...W and T16 series) are specially recommended for use on inductive loads, thanks to their high commutation performances. By using an internal ceramic pad, the BTA series provides voltage insulated tab (rated at 2500V RMS) complying with UL standards (File ref.: E81734).



## ABSOLUTE MAXIMUM RATINGS

| Symbol             | Parameter                                                                                    |                       |                           | Value                          | Unit                 |
|--------------------|----------------------------------------------------------------------------------------------|-----------------------|---------------------------|--------------------------------|----------------------|
| $I_{T(RMS)}$       | RMS on-state current (full sine wave)                                                        | D²PAK                 | $T_c = 100^\circ\text{C}$ | 16                             | A                    |
|                    |                                                                                              | TO-220AB              |                           |                                |                      |
|                    |                                                                                              | TO-220AB Ins.         | $T_c = 85^\circ\text{C}$  |                                |                      |
| $I_{TSM}$          | Non repetitive surge peak on-state current (full cycle, $T_j$ initial = $25^\circ\text{C}$ ) | F = 60 Hz             | t = 16.7 ms               | 168                            | A                    |
|                    |                                                                                              | F = 50 Hz             | t = 20 ms                 | 160                            |                      |
| $I^2t$             | $I^2t$ Value for fusing                                                                      | tp = 10 ms            |                           | 144                            | $\text{A}^2\text{s}$ |
| dI/dt              | Critical rate of rise of on-state current<br>$I_G = 2 \times I_{GT}$ , $t_r \leq 100$ ns     | F = 120 Hz            | $T_j = 125^\circ\text{C}$ | 50                             | A/ $\mu\text{s}$     |
| $V_{DSM}/V_{RSM}$  | Non repetitive surge peak off-state voltage                                                  | tp = 10 ms            | $T_j = 25^\circ\text{C}$  | $V_{DRM}/V_{RRM} + 100$        | V                    |
| $I_{GM}$           | Peak gate current                                                                            | tp = 20 $\mu\text{s}$ | $T_j = 125^\circ\text{C}$ | 4                              | A                    |
| $P_{G(AV)}$        | Average gate power dissipation                                                               |                       | $T_j = 125^\circ\text{C}$ | 1                              | W                    |
| $T_{stg}$<br>$T_j$ | Storage junction temperature range<br>Operating junction temperature range                   |                       |                           | - 40 to + 150<br>- 40 to + 125 | $^\circ\text{C}$     |

## BTA/BTB16 and T16 Series

### ELECTRICAL CHARACTERISTICS (Tj = 25°C, unless otherwise specified)

#### ■ SNUBBERLESS™ and LOGIC LEVEL (3 Quadrants)

| Symbol              | Test Conditions                                                         | Quadrant     |      | T16   | BTA/BTB16 |     |      | Unit |
|---------------------|-------------------------------------------------------------------------|--------------|------|-------|-----------|-----|------|------|
|                     |                                                                         |              |      | T1635 | SW        | CW  | BW   |      |
| I <sub>GT</sub> (1) | V <sub>D</sub> = 12 V    R <sub>L</sub> = 33 Ω                          | I - II - III | MAX. | 35    | 10        | 35  | 50   | mA   |
| V <sub>GT</sub>     |                                                                         | I - II - III | MAX. | 1.3   |           |     |      | V    |
| V <sub>GD</sub>     | V <sub>D</sub> = V <sub>DRM</sub> R <sub>L</sub> = 3.3 kΩ    Tj = 125°C | I - II - III | MIN. | 0.2   |           |     |      | V    |
| I <sub>H</sub> (2)  | I <sub>T</sub> = 500 mA                                                 |              | MAX. | 35    | 15        | 35  | 50   | mA   |
| I <sub>L</sub>      | I <sub>G</sub> = 1.2 I <sub>GT</sub>                                    | I - III      | MAX. | 50    | 25        | 50  | 70   | mA   |
|                     |                                                                         | II           |      | 60    | 30        | 60  | 80   |      |
| dV/dt (2)           | V <sub>D</sub> = 67 % V <sub>DRM</sub> gate open    Tj = 125°C          |              | MIN. | 500   | 40        | 500 | 1000 | V/μs |
| (dI/dt)c (2)        | (dV/dt)c = 0.1 V/μs    Tj = 125°C                                       | MIN.         |      | -     | 8.5       | -   | -    | A/ms |
|                     | (dV/dt)c = 10 V/μs    Tj = 125°C                                        |              |      | -     | 3.0       | -   | -    |      |
|                     | Without snubber    Tj = 125°C                                           |              |      | 8.5   | -         | 8.5 | 14   |      |

#### ■ STANDARD (4 Quadrants)

| Symbol              | Test Conditions                                                         | Quadrant           |      | BTA/BTB16 |           | Unit |
|---------------------|-------------------------------------------------------------------------|--------------------|------|-----------|-----------|------|
|                     |                                                                         |                    |      | C         | B         |      |
| I <sub>GT</sub> (1) | V <sub>D</sub> = 12 V    R <sub>L</sub> = 33 Ω                          | I - II - III<br>IV | MAX. | 25<br>50  | 50<br>100 | mA   |
| V <sub>GT</sub>     |                                                                         | ALL                | MAX. | 1.3       |           | V    |
| V <sub>GD</sub>     | V <sub>D</sub> = V <sub>DRM</sub> R <sub>L</sub> = 3.3 kΩ    Tj = 125°C | ALL                | MIN. | 0.2       |           | V    |
| I <sub>H</sub> (2)  | I <sub>T</sub> = 500 mA                                                 |                    | MAX. | 25        | 50        | mA   |
| I <sub>L</sub>      | I <sub>G</sub> = 1.2 I <sub>GT</sub>                                    | I - III - IV       | MAX. | 40        | 60        | mA   |
|                     |                                                                         | II                 |      | 80        | 120       |      |
| dV/dt (2)           | V <sub>D</sub> = 67 % V <sub>DRM</sub> gate open    Tj = 125°C          |                    | MIN. | 200       | 400       | V/μs |
| (dV/dt)c (2)        | (dI/dt)c = 7 A/ms    Tj = 125°C                                         |                    | MIN. | 5         | 10        | V/μs |

### STATIC CHARACTERISTICS

| Symbol                               | Test Conditions                         |            |      | Value | Unit |
|--------------------------------------|-----------------------------------------|------------|------|-------|------|
| V <sub>TM</sub> (2)                  | I <sub>TM</sub> = 22.5 A    tp = 380 μs | Tj = 25°C  | MAX. | 1.55  | V    |
| V <sub>to</sub> (2)                  | Threshold voltage                       | Tj = 125°C | MAX. | 0.85  | V    |
| R <sub>d</sub> (2)                   | Dynamic resistance                      | Tj = 125°C | MAX. | 25    | mΩ   |
| I <sub>DRM</sub><br>I <sub>RRM</sub> | V <sub>DRM</sub> = V <sub>RRM</sub>     | Tj = 25°C  | MAX. | 5     | μA   |
|                                      |                                         | Tj = 125°C |      | 2     | mA   |

**Note 1:** minimum IGT is guaranteed at 5% of IGT max.

**Note 2:** for both polarities of A2 referenced to A1

# THERMAL RESISTANCES

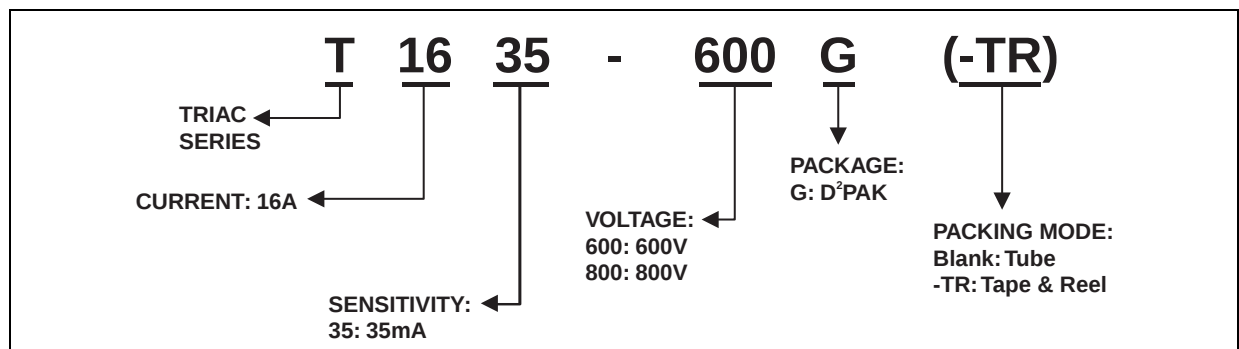
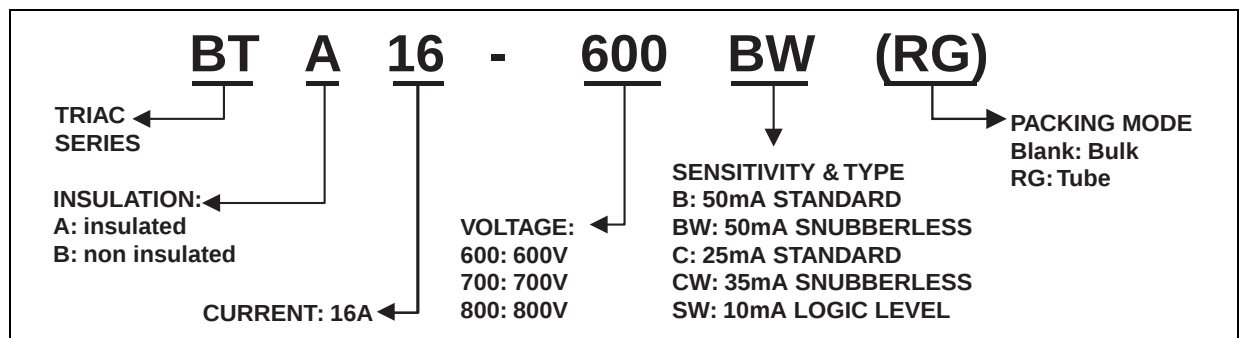
| Symbol        | Parameter             |                       | Value                          | Unit |
|---------------|-----------------------|-----------------------|--------------------------------|------|
| $R_{th(j-c)}$ | Junction to case (AC) |                       | D <sup>2</sup> PAK<br>TO-220AB | 1.2  |
|               |                       |                       | TO-220AB Insulated             | 2.1  |
| $R_{th(j-a)}$ | Junction to ambient   | S = 1 cm <sup>2</sup> | D <sup>2</sup> PAK             | 45   |
|               |                       |                       | TO-220AB                       | 60   |
|               |                       |                       | TO-220AB Insulated             |      |

S: Copper surface under tab

# PRODUCT SELECTOR

| Part Number     | Voltage(xxx) |       |       | Sensitivity | Type        | Package            |
|-----------------|--------------|-------|-------|-------------|-------------|--------------------|
|                 | 600 V        | 700 V | 800 V |             |             |                    |
| BTA/BTB16-xxxB  | X            | X     | X     | 50 mA       | Standard    | TO-220AB           |
| BTA/BTB16-xxxBW | X            | X     | X     | 50 mA       | Snubberless | TO-220AB           |
| BTA/BTB16-xxxC  | X            | X     | X     | 25 mA       | Standard    | TO-220AB           |
| BTA/BTB16-xxxCW | X            | X     | X     | 35 mA       | Snubberless | TO-220AB           |
| BTA/BTB16-xxxSW | X            | X     | X     | 10 mA       | Logic level | TO-220AB           |
| T1635-xxxG      | X            |       | X     | 35 mA       | Snubberless | D <sup>2</sup> PAK |

# ORDERING INFORMATION

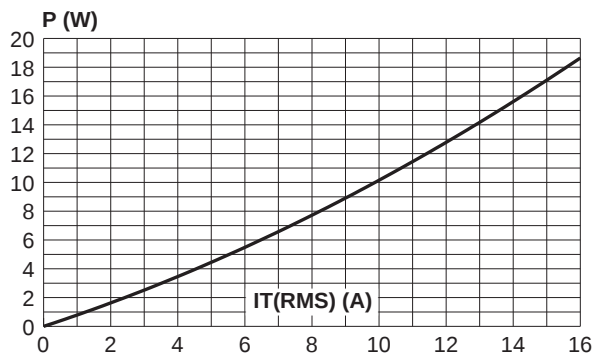


## OTHER INFORMATION

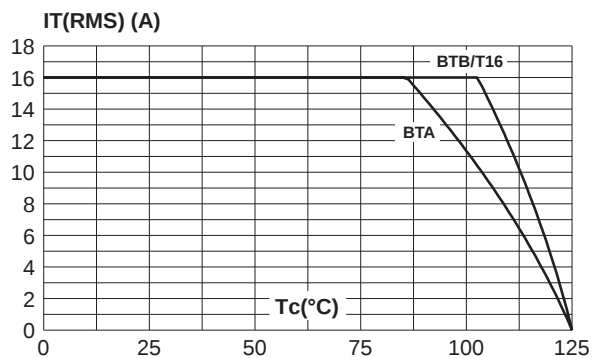
| Part Number       | Marking         | Weight | Base quantity | Packing mode |
|-------------------|-----------------|--------|---------------|--------------|
| BTA/BTB16-xxxzy   | BTA/BTB16xxxzy  | 2.3 g  | 250           | Bulk         |
| BTA/BTB16-xxxzyRG | BTA/BTB16-xxxzy | 2.3 g  | 50            | Tube         |
| T1635-xxxG        | T1635xxxG       | 1.5 g  | 50            | Tube         |
| T1635-xxxG-TR     | T1635xxxG       | 1.5 g  | 1000          | Tape & reel  |

**Note:** xxx = voltage, y = sensitivity, z = type

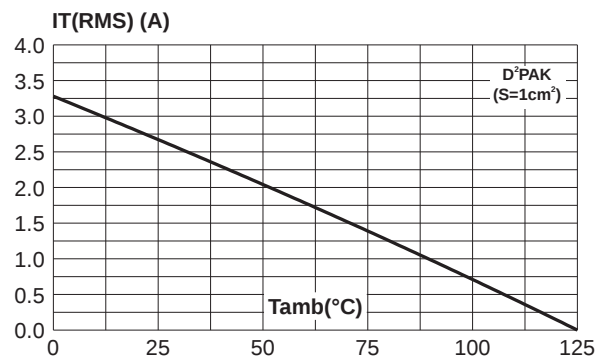
**Fig. 1:** Maximum power dissipation versus RMS on-state current (full cycle).



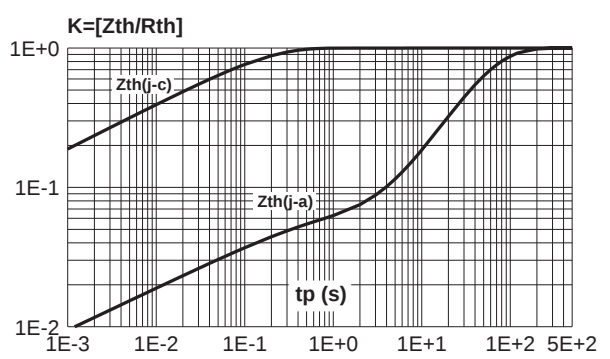
**Fig. 2-1:** RMS on-state current versus case temperature (full cycle).



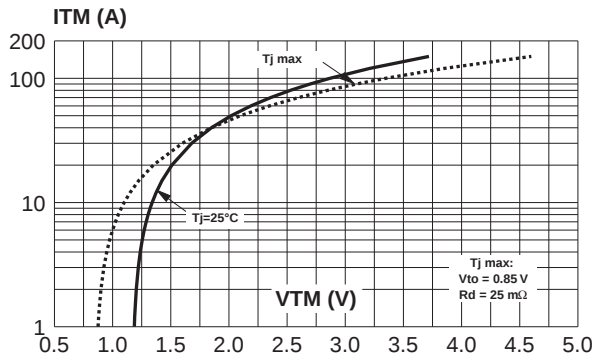
**Fig. 2-2:** D<sup>2</sup>PAK RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness: 35 µm), full cycle.



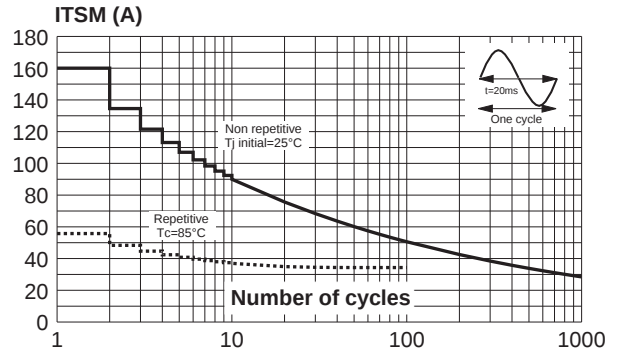
**Fig. 3:** Relative variation of thermal impedance versus pulse duration.



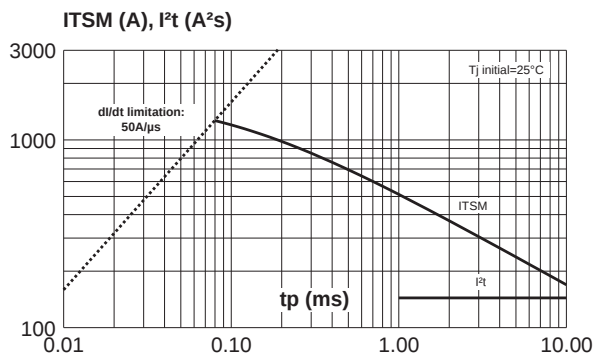
**Fig. 4:** On-state characteristics (maximum values)



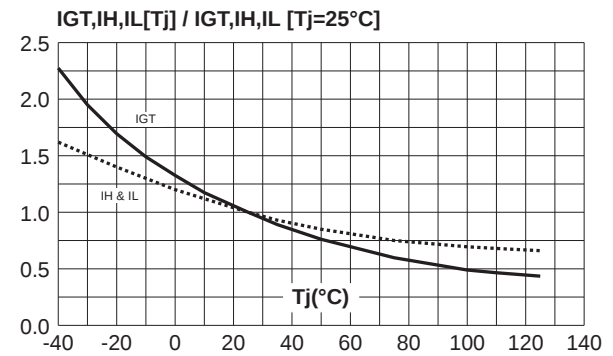
**Fig. 5:** Surge peak on-state current versus number of cycles.



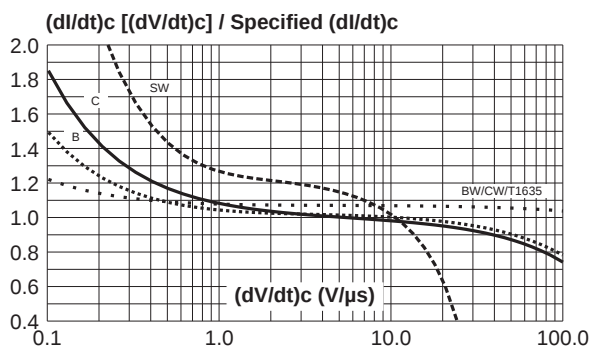
**Fig. 6:** Non-repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10\text{ms}$ , and corresponding value of  $I^2t$ .



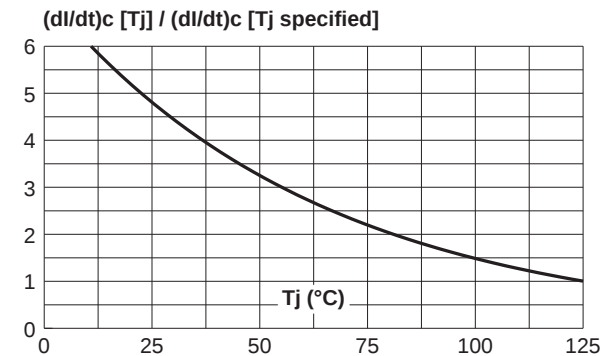
**Fig. 7:** Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values).



**Fig. 8:** Relative variation of critical rate of decrease of main current versus  $(dV/dt)_c$  (typical values).

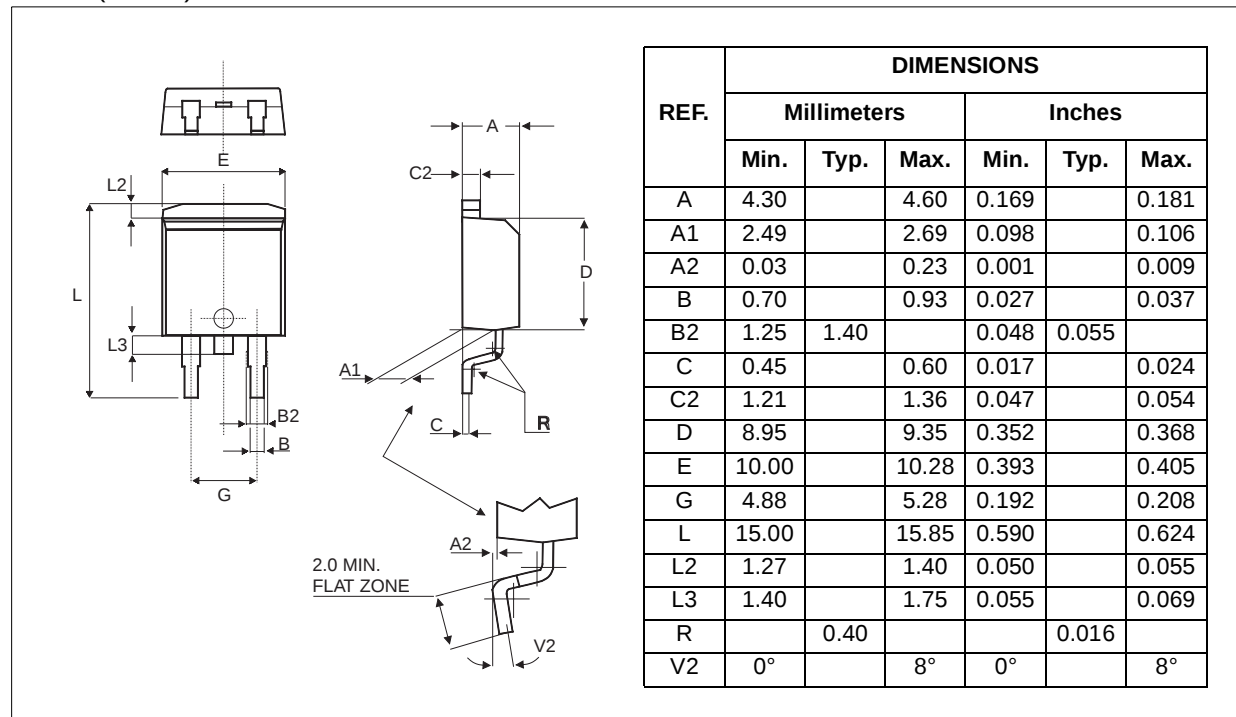


**Fig. 9:** Relative variation of critical rate of decrease of main current versus junction temperature.

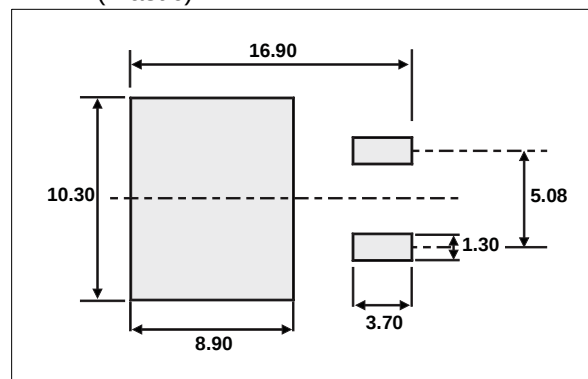




## PACKAGE MECHANICAL DATA

D<sup>2</sup>PAK (Plastic)

## FOOTPRINT DIMENSIONS (in millimeters)

D<sup>2</sup>PAK (Plastic)

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

© The ST logo is a registered trademark of STMicroelectronics

© 2002 STMicroelectronics - Printed in Italy - All Rights Reserved

STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - Finland - France - Germany  
 Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore  
 Spain - Sweden - Switzerland - United Kingdom - United States.

<http://www.st.com>